Effect of diet and bacterial clearance on energy expenditure in the cockroach *Periplaneta americana*

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Introduction

- Insect gut-associated microbiota are postulated to supply nutritional requirements of their host (Douglas 2009, Func. Ecol.)
- Gut microbiota of *Periplaneta americana* probably metabolizes cellulose (Gijzen et al., 1994, Appl. Env. Microbiol.), and provides essential amino acids to its host (Ayayee et al., 2015 submitted, SpringerPlus).
- We hypothesize that the presence of gut microbiota modifies resting metabolic rate (MR) of the host by contributing to the nutritional state of the insect.
- We tested this idea by measuring metabolic rates on individuals of *P. Americana,* after clearing gut microbiota with the antibiotic Chloramphenicol and modifying diet quality.

Materials and Methods

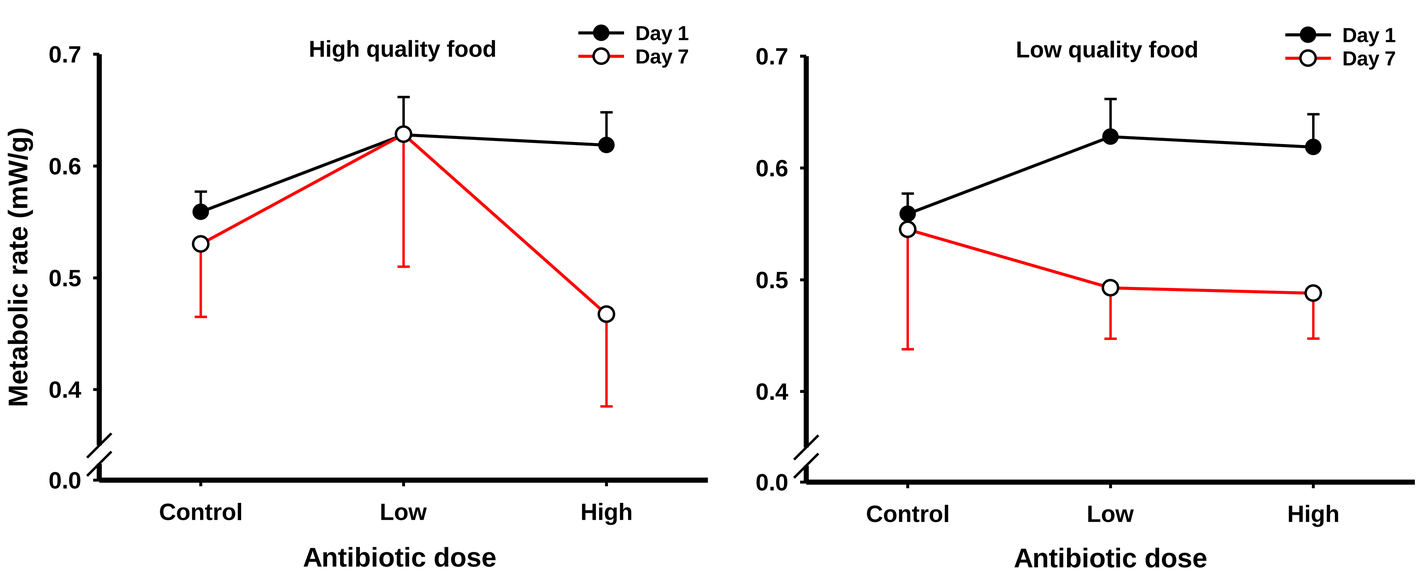
Antibiotic dose

Food quality	**Control** (0 ppm)	**Low** (500 ppm)	**High** (5,000 ppm)
High (100% dog food)	n = 4	n = 7	n = 6
Low (30% dog food + 70% cellulose)	n = 6	n = 7	n = 6

Oxygen consumption measurements to estimate metabolic rates (MR) at days 1 and 7

DNA extraction and bacterial load quantification (IN PROGRESS)

Results



Mass-specific metabolic rates of individuals of *Periplaneta americana* fed with high quality food (left) or low quality food (right), and exposed to three dose levels of the antibiotic Chloramphenicol. We found a significant interaction “Time x Food quality” (Repeated measures ANOVA, F = 4.13, p = 0.05). Cockroaches fed with low quality food for a week and exposed to both the low and the high antibiotic dose decreased their MR compared with controls. Animals fed with high quality food for a week only decreased MR significantly when exposed to a high antibiotic dose.

Conclusions

- The low dose of antibiotic seems to have some effect on the animals fed with the low quality diet, but not the animals fed with the high quality diet. It could be the case that animals fed with the high quality diet compensate the moderate loss of essential nutrients produced by bacteria by eating higher amounts of food, hence the increase in metabolic rate (although not significant) between controls and animals exposed to a low dose of antibiotic. However, animals eating the low quality food would not be able to ingest enough essential nutrients to compensate for a moderate bacterial loss, hence the drop in metabolic rate (although not significant) between controls and cockroaches exposed to a low dose of antibiotic.
- Cockroaches exposed to a high dose of antibiotic presumably lose their gut bacteria completely. In this situation, there is no compensatory effect from the diet, and metabolic rates drop at similar levels in both the high and the low quality food groups.
- Next steps: (1) correlate our data of MR with data of bacterial load in all individuals. (2) increase sample size in all groups to 12 individuals.

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